

User Name: p

User Phone:

Workstation Id: GPRBURGM

Printer Id: gbgnptr

Date: Thu Sep 3, 1998

Time: 12:13:19

Job # 6833

<u>Patent ID</u>	<u>Document Not Available</u>	<u>Pages Not Available</u>	<u>150 dpi Pages</u>	<u>Unscanned Pages</u>	<u>Total Pages Printed</u>
05180575	000	000	000	000	005

Filtering Started: Thu Sep 3 12:13:05 1998
Retrieval Started: Thu Sep 3 12:13:05 1998

Filtering Finished: Thu Sep 3 12:13:19 1998
Printing Started: Thu Sep 3 12:13:19 1998

09/210,373

=> e fujiki, hironao/in

E#	FILE	FREQUENCY	TERM
--	----	-----	----
E1	USPAT	1	FUJIKI, HIROAKI/IN
E2	USPAT	7	FUJIKI, HIROKAZU/IN
E3	USPAT	62 -->	FUJIKI, HIRONAO/IN
E4	USPAT	1	FUJIKI, HIRONARI/IN
E5	USPAT	6	FUJIKI, HIROSHI/IN
E6	USPAT	4	FUJIKI, HIROYUKI/IN
E7	USPAT	1	FUJIKI, JEAN S/IN
E8	USPAT	1	FUJIKI, JUNICHI/IN
E9	USPAT	2	FUJIKI, KAZUHIRO/IN
E10	USPAT	1	FUJIKI, KAZUYUKI/IN
E11	USPAT	1	FUJIKI, KEIICHI/IN
E12	USPAT	1	FUJIKI, KEISUKE/IN

=> s e3

L1 62 "FUJIKI, HIRONAO"/IN

=> d 11 1-62

1. 5,905,101, May 18, 1999, Ablator compositions; **Hironao Fujiki**, et al., 523/138; 524/100, 296, 298, 493, 496, 847 [IMAGE AVAILABLE]
2. 5,900,438, May 4, 1999, Thermosetting foamable organopolysiloxane composition and process of curing the same; Kei Miyoshi, et al., 521/77, 91, 134, 154; 528/26, 31 [IMAGE AVAILABLE]
3. 5,879,809, Mar. 9, 1999, Thermoplastic resin/oil-bleeding silicone rubber integrally molded articles; Shigeru Muramatsu, et al., 428/412, 447, 458, 461, 475.5; 524/506, 537, 538, 539 [IMAGE AVAILABLE]
4. 5,854,344, Dec. 29, 1998, Organopolysiloxane composition for electrical insulation; Mikio Shiono, et al., 524/862, 493, 588, 860, 863, 865; 525/477; 528/15, 31, 32 [IMAGE AVAILABLE]
5. 5,792,812, Aug. 11, 1998, Thermoplastic resin compositions for use in integral molding with silicone rubber and integrally molded parts; **Hironao Fujiki**, et al., 525/105; 428/412, 447, 451; 525/106, 461, 464 [IMAGE AVAILABLE]
6. 5,792,723, Aug. 11, 1998, Platinum catalyst, its preparation, and curable organopolysiloxane composition comprising the same; Masayuki Ikeno, et al., 502/158, 150, 159, 171, 232, 258, 261, 262, 334 [IMAGE AVAILABLE]
7. 5,786,414, Jul. 28, 1998, Building rubber members and method for imparting hydrophilic surface thereto; Makoto Chikuni, et al., 524/413; 522/66, 99, 148; 524/588, 783 [IMAGE AVAILABLE]

07 Jun. 1999; 13 18

SYNTHETIC PAPER FOR WRITING AND PRINTING

FIELD OF THE INVENTION

This invention relates to a synthetic paper with excellent pencil writability and printability. More particularly, it relates to a synthetic paper which has sufficient opaqueness for writing with a pencil and which, when printed by offset printing or gravure printing and piled one on another, does not become uneven or curl due to penetration of solvents of printing inks.

BACKGROUND OF THE INVENTION

A synthetic paper obtained by stretching a polypropylene film containing from 8 to 65% by weight of an inorganic fine powder has recently been developed and is in practical use as disclosed in JP-B-46-40794 (corresponding to U.S. Pat. Nos. 4,318,950 and 4,075,050), JP-A-56-141339 and JP-A-57-181829 (the term "JP-B" as used herein means an "examined published Japanese patent application", and the term "JP-A" as used herein means an "unexamined published Japanese patent application").

Synthetic paper of this type has a microstructure in which fine voids are formed around inorganic fine powder and a vast number of streaking cracks are formed on the surface. Synthetic paper having a structure such as this is not only lightweight but has excellent printing ink receptivity, pencil writability, water resistance, etc.

Various improvements have hitherto been made in the above-described synthetic paper. For example, an aqueous solution of an anti-electrostatic acrylic copolymer, polyethyleneimine, etc. is coated thereon at a dry spread of from 0.005 to 1 g/m², followed by drying to produce improved offset printability, as disclosed, e.g., in JP-A-50-10624, JP-A-57-149363, and JP-A-61-3748.

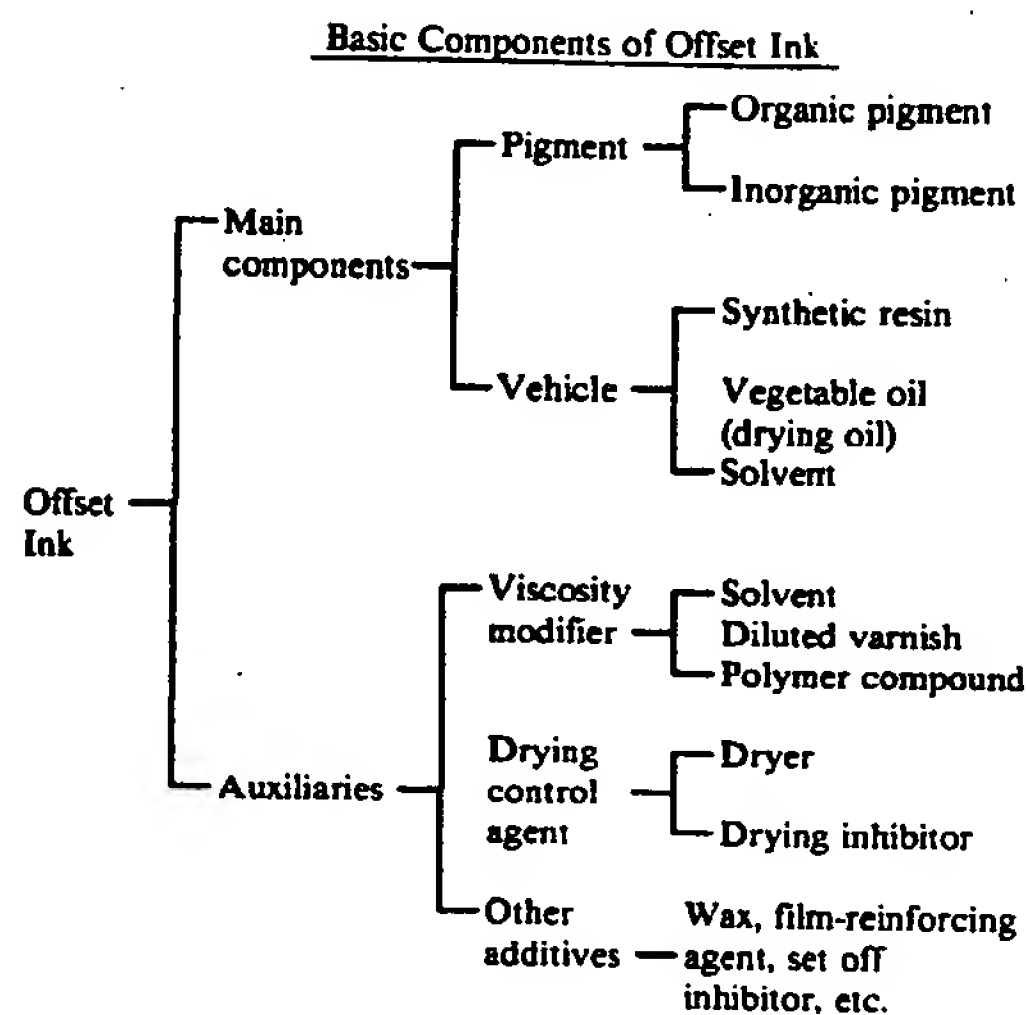
A polypropylene film without any inorganic fine powder on the surface of the synthetic paper to provide high-gloss and printable synthetic paper has been developed (refer to JP-A-61-3748) or a uniaxially stretched styrene-polypropylene copolymer film containing 0 to 3% by weight of an inorganic fine powder on the surface of the synthetic paper, with the styrene-polypropylene copolymer film having a thickness one-tenth to equal to the average particle size of said inorganic fine powder to thereby prevent difficulties arising from paper dust is known as disclosed in JP-A-62-249741.

These synthetic papers possess characteristics which are not possessed by conventional paper such as water resistance, chemical resistance and mechanical strength yet they have conventional paper properties such as whiteness, opaqueness and smoothness and are used in posters, calendars, books, maps, labels, and various advertising media, neatly printed in full color by offset printing, gravure printing, screen printing, and the like.

However, in spite of the above-mentioned superiority, polypropylene-based synthetic paper has a disadvantage in that hydrocarbon compounds, particularly hydrocarbon solvents contained in quantity in inks used in offset printing, gravure printing and screen printing swells the polypropylene resin and curling occurs. Eventually this results in an unevenness due to swelling that makes the printed matter invaluable.

The swelling of synthetic paper with solvents is explained below in detail taking offset inks for instance into consideration. Because multicolor printing can be conducted with ease, offset printing is used for printing

on art paper, fine paper, coated paper, polyethylene terephthalate films, polyvinyl chloride films, etc. General purpose offset inks (hereinafter referred to as GP offset inks) usually employed in offset printing comprise the following basic components in the compounding ratio shown in Table 1 below.



The composition of a special offset ink developed for non-absorbing materials (hereinafter described) is also shown in Table 1 below.

TABLE 1

Component	GP Offset Ink (parts by weight)	Offset Ink for Non-absorbing Materials (parts by weight)
Pigment	15 to 50 (20)	(25)
Resin	25 to 30 (30)	(30)
Drying oil	10 to 15 (10)	(34)
High-boiling petroleum solvent	20 to 45 (35)	(5)
Dryer	0.5 to 2 (1)	(2)
Others	2 to 5 (4)	(4)
Total weight	100	100

The numbers in parentheses indicate the composition of an example of commercially available inks.

In order to reduce drying time, a drying oil compounded with a resin and a mineral oil (high-boiling petroleum solvent) has been used as a vehicle to provide a quick-drying GP offset ink.

Where synthetic paper comprising a stretched polyolefin film containing an inorganic fine powder, e.g., the film disclosed in JP-B-46-40794, JP-A-62-227933, JP-A-61-3748, and JP-A-60-79951, is printed with the above-described GP offset ink, the polyolefin swells due to the solvent present in the ink, particularly high-boiling petroleum solvents (e.g., mineral oils), and the printed synthetic paper suffers from a so-called solvent attack, i.e., local unevenness of the surface or curling as a whole. Thus, the practical application of such GP offset inks to offset printing on polyolefin films is difficult.

In order to avoid such a solvent attack, a special offset ink with a reduced amount of high-boiling petroleum solvent as shown in Table 1 above is now employed for particular use on non-absorbing materials such as polyolefin films.

8. 5,767,193, Jun. 16, 1998, Curable silicone elastomer composition and method of preparing the same; **Hironao Fujiki**, et al., 524/847, 493, 588, 862, 863 [IMAGE AVAILABLE]
9. 5,668,190, Sep. 16, 1997, Foamable silicone rubber composition; Atsushi Yaginuma, et al., 521/142, 143, 145, 149, 150, 154 [IMAGE AVAILABLE]
10. 5,661,198, Aug. 26, 1997, Ablator compositions; Yoshifumi Inatani, et al., 523/179; 524/862; 525/478; 528/15, 31, 32 [IMAGE AVAILABLE]
11. 5,616,632, Apr. 1, 1997, Silicone compositions; **Hironao Fujiki**, et al., 523/211, 212; 525/478; 528/15 [IMAGE AVAILABLE]
12. 5,571,853, Nov. 5, 1996, Gel-forming silicone composition; Masayuki Ikeno, et al., 524/268, 588; 525/478; 528/15, 31, 32 [IMAGE AVAILABLE]
13. 5,536,803, Jul. 16, 1996, Adhesive silicone compositions; **Hironao Fujiki**, et al., 528/15; 525/478, 479; 528/31 [IMAGE AVAILABLE]
14. 5,530,060, Jun. 25, 1996, Silicone composition capable of yeilding a cured product having good thermal conductivity; **Hironao Fujiki**, et al., 524/786, 862 [IMAGE AVAILABLE]
15. 5,529,837, Jun. 25, 1996, Silicone coated base material and air bag base material; **Hironao Fujiki**, et al., 442/136; 280/728.1; 428/36.1, 36.8; 442/168 [IMAGE AVAILABLE]
16. 5,516,838, May 14, 1996, Flame retardant silicone compositions; **Hironao Fujiki**, et al., 524/711, 714, 720, 722, 731, 862 [IMAGE AVAILABLE]
17. 5,506,303, Apr. 9, 1996, Process for preparing a liquid silicone rubber base composition; Takeo Yoshida, et al., 524/847, 862 [IMAGE AVAILABLE]
18. 5,506,302, Apr. 9, 1996, Organopolysiloxane composition and rubber substrate having a coating thereof; Mikio Shiono, et al., 524/731, 789, 861; 525/104, 106, 405, 446, 464, 478 [IMAGE AVAILABLE]
19. 5,504,176, Apr. 2, 1996, Silicone rubber composition; **Hironao Fujiki**, 528/18, 33, 34 [IMAGE AVAILABLE]
20. 5,504,147, Apr. 2, 1996, Process for preparing a liquid silicone composition; **Hironao Fujiki**, et al., 524/730; 523/209, 212; 524/188, 262, 492, 493, 588, 862 [IMAGE AVAILABLE]
21. 5,438,094, Aug. 1, 1995, Adhesive silicone compositions; **Hironao Fujiki**, et al., 524/730, 742, 743, 744, 773, 774, 856, 862; 528/15 [IMAGE AVAILABLE]
22. 5,418,065, May 23, 1995, Integrally molded article of silicone rubber and modified polypropylene resin; **Hironao Fujiki**, et al., 428/451, 447 [IMAGE AVAILABLE]
23. 5,412,135, May 2, 1995, Organic silicon compounds and curable organopolysiloxane compositions; Kenichi Fukuda, et al., 556/448; 528/12, 15; 556/451 [IMAGE AVAILABLE]
24. 5,405,896, Apr. 11, 1995, Adhesive silicone rubber compositions; **Hironao Fujiki**, et al., 524/265, 268, 730, 731, 862; 525/100, 105, 106, 393, 431, 446, 464, 474; 528/15, 31, 32 [IMAGE AVAILABLE]

However, where printing is carried out by using the above-described special offset ink for polyolefin films, printers encounter difficulties in controlling the balance between the amount of damping water and that of the ink as compared with use of GP offset inks and are also confronted with a problem of variation in ink viscosity on printing machines, which deteriorates workability. For these reasons, printers are unwilling to use these kind of printing inks and, as a result, printers and ink manufacturers who practice printing of synthetic papers are naturally limited. Therefore, development of polyolefin synthetic paper on which GP offset inks can be used without problems has been desired.

Since in practice general printers carry out, as a regular routine, offset printing on pulp paper, such as fine paper and coated paper, with a GP offset ink, they must change the GP offset ink for the special offset ink for non-absorbing materials each time polyolefin synthetic paper is to be printed. Considering much time and labor are required for the ink change, general printers avoid printing of polyolefin synthetic paper, and this has interfered with the spread of offset printing on polyolefin synthetic paper.

SUMMARY OF THE INVENTION

An object of the present invention is to provide synthetic paper where unevenness or overall curling when offset printed in multicolor even with a GP offset ink hardly occurs and which also has excellent pencil writability.

As a result of extensive investigations, it has now been found that the above object of the present invention is accomplished by synthetic paper comprising

a finely porous polyolefin film having an opacity of at least 80% and

a stretched ethylene-vinyl alcohol copolymer film which prevents the solvent of a GP offset ink from penetrating into said polyolefin film on one or both sides thereof, with at least one of the stretched ethylene-vinyl alcohol copolymer films on which offset printing is to be done having a pigment coat (coat layer) thereon. The present invention has been completed based on this finding.

The present invention thus provides synthetic paper with excellent pencil writability and printability comprising

(a) a finely porous polyolefin film layer having an opacity of at least 80% which is obtained by stretching a polyolefin film containing from 8 to 65% by weight of an inorganic fine powder,

(b) a stretched ethylene-vinyl alcohol copolymer film layer on one or both sides of the polyolefin film layer (a), and

(c) a coat layer on at least one of the stretched ethylene-vinyl alcohol copolymer film layers (b).

BRIEF DESCRIPTION OF THE DRAWING

FIGS. 1 and 2 each illustrate an enlarged cross section of the synthetic paper according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The synthetic paper having excellent printability according to the present invention may have a five-, six-, seven-, eight-, nine-, ten- or even more multi-layered structure and includes a laminate film as shown in FIG. 1 comprising base layer 1 comprising a finely

porous polyolefin film having an opacity of at least 80% which is obtained by stretching a polyolefin film containing from 8 to 65% by weight of an inorganic fine powder, stretched ethylene-vinyl alcohol copolymer film 3 laminated on one or both sides of base layer 1 via an adhesive or by fusion bonding, and coat layer 4 laminated on at least one of the stretched ethylene-vinyl alcohol copolymer films; a laminate film as shown in FIG. 2 comprising a composite film support which comprises base layer 1 comprising a biaxially stretched thermoplastic resin film containing from 3 to 40% by weight of an inorganic fine powder having laminated on one or both sides thereof paper-like surface layer 2a and/or a paper-like back layer 2b comprising a uniaxially stretched polyolefin resin film containing from 8 to 65% by weight of an inorganic fine powder, uniaxially stretched ethylene-vinyl alcohol copolymer surface layer 3a or layers 3a and 3b laminated on paper-like layer 2a or both of paper-like layers 2a and 2b via adhesive resin layer 3a' or layers 3a' and 3b', and coat layer 4a or layers 4a and 4b laminated on at least one of stretched ethylene-vinyl alcohol copolymer films 3a and 3b; a laminate film of FIG. 2 additionally having another resin layer 5 between paper-like layer 2a or 2b and base layer 1; and a laminate film of FIG. 1 or 2 additionally having another resin layer 6 between the stretched ethylene-vinyl alcohol copolymer film and the coat layer.

Polyolefins which can be used as a material of the finely porous polyolefin film include polyolefin resins, e.g., polyethylene, polypropylene, an ethylene-propylene copolymer, polybutene, polystyrene, an ethylene-vinyl acetate copolymer, an ethylene-acrylic ester copolymer, a styrene-propylene copolymer, a styrene-ethylene copolymer, and maleic anhydride-grafted polypropylene. These polyolefin resins may be used either alone or in combinations of two or more thereof.

Preferred finely porous polyolefin films are a uniaxially or biaxially stretched film of an olefin homo- or copolymer comprising 50% by weight or more of ethylene and/or propylene and containing from 8 to 65% by weight of an inorganic fine powder and/or an organic filler. Commercially available polyolefin synthetic papers, such as Yupo FPG, Yupo KPK, Yupo TPG, Yupo GFG, Yupo CFG, and Yupo SGG (all produced by Oji Yuka Goseishi Co., Ltd.) can be utilized as such a polyolefin base layer.

The inorganic fine powder which can be incorporated into the polyolefin resin to provide a finely porous film includes talc, silica, diatomaceous earth, calcium carbonate, magnesium carbonate, barium sulfate, and titanium oxide each having a particle size of from 0.03 to 16 μm .

The ethylene-vinyl alcohol copolymer which can be used in the stretched ethylene-vinyl alcohol copolymer film serving to prevent penetration of printing ink solvents includes a hydroxyl-modified ethylene-vinyl acetate copolymer obtained by modifying an ethylene-vinyl acetate copolymer having an ethylene content of from 30 to 70 mol % by saponifying at least 90%, and preferably 99% or more, of the acetyl groups thereof to convert them to hydroxyl groups as described, e.g., in U.S. Pat. No. 3,419,654.

If desired, the other resin layer 5 comprising a thermoplastic resin may be additionally provided as stated above for the purpose of improving the mechanical strength of the finely porous polyolefin film having an opacity of at least 80% or providing the synthetic paper

25. 5,367,001, Nov. 22, 1994, Impression composition; Kunio Itoh, et al., 523/109; 524/751, 780, 784, 788, 861 [IMAGE AVAILABLE]
26. 5,366,806, Nov. 22, 1994, Integrated thermoplastic resin/silicone rubber articles and method for making; **Hironao Fujiki**, et al., 428/412, 421, 425.5, 447, 451 [IMAGE AVAILABLE]
27. 5,366,805, Nov. 22, 1994, Polycarbonate resin/silicone rubber integrally molded article and method for making; **Hironao Fujiki**, et al., 428/412; 264/255; 427/387; 525/464 [IMAGE AVAILABLE]
28. 5,360,858, Nov. 1, 1994, Silicone rubber adhesive compositions; **Hironao Fujiki**, et al., 524/434, 588, 731, 784, 862; 525/478; 528/15, 31, 32 [IMAGE AVAILABLE]
29. 5,352,724, Oct. 4, 1994, Silicone rubber composition with improved fluidity; **Hironao Fujiki**, et al., 524/398, 437, 493, 588, 783, 786, 837, 847, 862 [IMAGE AVAILABLE]
30. 5,349,037, Sep. 20, 1994, Adhesive composition; **Hironao Fujiki**, et al., 528/15, 42 [IMAGE AVAILABLE]
31. 5,332,795, Jul. 26, 1994, Silicone gel composition excellent in damping property; **Hironao Fujiki**, et al., 528/15; 525/478, 479; 528/31, 32, 42, 43 [IMAGE AVAILABLE]
32. 5,326,844, Jul. 5, 1994, Primer compositions; **Hironao Fujiki**, et al., 528/15; 524/730, 765, 792, 859, 860; 525/478; 528/17, 18; 556/438, 439, 440, 441 [IMAGE AVAILABLE]
33. 5,292,848, Mar. 8, 1994, Fluorosilicone composition and its gellike cured product; Masayuki Ikeno, et al., 528/15, 36 [IMAGE AVAILABLE]
34. 5,288,795, Feb. 22, 1994, Mold-releasable curable organopolysiloxane composition; **Hironao Fujiki**, et al., 524/731, 779, 847, 861, 863 [IMAGE AVAILABLE]
35. 5,279,890, Jan. 18, 1994, Silicone composite product and process for preparing the same; Masayuki Ikeno, et al., 428/217; 427/387; 428/447 [IMAGE AVAILABLE]
36. 5,276,087, Jan. 4, 1994, Curable silicone composition and cured product thereof; **Hironao Fujiki**, et al., 524/786, 847, 860, 861, 862, 863 [IMAGE AVAILABLE]
37. 5,268,433, Dec. 7, 1993, Silicone composition and a highly damping hardened silicone material; Masayuki Ikeno, et al., 525/478; 528/15 [IMAGE AVAILABLE]
38. 5,248,751, Sep. 28, 1993, Curable organopolysiloxane compositions; Toshiaki Takahashi, et al., 528/15; 524/265, 266, 730 [IMAGE AVAILABLE]
39. 5,236,997, Aug. 17, 1993, Curable fluorosilicone rubber composition; **Hironao Fujiki**, 524/731, 863, 864; 525/477; 528/17, 18, 34, 42 [IMAGE AVAILABLE]
40. 5,216,104, Jun. 1, 1993, Curable silicone rubber compositions and products of curing thereof; Takehide Okami, et al., 528/15; 524/425, 430, 431, 432, 440, 448, 588, 780, 783, 785, 786, 788, 789, 862; 525/478 [IMAGE AVAILABLE]
41. 5,204,437, Apr. 20, 1993, Organopolysiloxane composition and its gel cured product; Masayuki Ikeno, et al., 528/15; 525/478; 528/31, 32 [IMAGE AVAILABLE]

with various properties required for synthetic paper. Examples of useful thermoplastic resins as resin layer 5 include polyolefin resins, e.g., polyethylene, polypropylene, an ethylene-propylene copolymer, an ethylene-vinyl acetate copolymer and poly(4-methylpentene-1), polystyrene, polyamide, polyethylene terephthalate, either alone or in combination thereof. From the standpoint of water resistance and chemical resistance, preferred thermoplastic resins are polypropylene, polyethylene, an ethylene-propylene copolymer, and mixtures thereof. 10

It is preferable to provide an adhesive resin layer between the finely porous polyolefin film and the stretched ethylene-vinyl alcohol copolymer film and between the stretched ethylene-vinyl alcohol copolymer film and the coat layer. Useful adhesive resins include graft-modified olefin polymers obtained by grafting an unsaturated carboxylic acid or a derivative thereof to an olefin polymer. Examples of olefin polymers which can be modified include polyethylene, polypropylene, polybutene, poly(4-methylpentene-1), and an ethylene-propylene copolymer. Examples of grafting monomers include unsaturated carboxylic acids, e.g., acrylic acid, methacrylic acid, maleic acid, fumaric acid, and itaconic acid, and derivatives thereof, e.g., acid anhydrides, esters, amides, imides and metal salts. Specific examples of suitable carboxylic acid derivatives are maleic anhydride, itaconic anhydride, citraconic anhydride, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, butyl acrylate, butyl methacrylate, glycidyl acrylate, glycidyl methacrylate, monoethyl maleate, diethyl maleate, monomethyl fumarate, dimethyl fumarate, monomethyl itaconate, diethyl itaconate, acrylamide, methacrylamide, maleinamic acid, maleinamide, maleic acid N-monoethylamide, maleic acid N,N-diethylamide, maleic acid N-monobutylamide, maleic acid N,N-dibutylamide, fumaramic acid, fumaramide, fumaric acid N-monoethylamide, fumaric acid N,N-diethylamide, fumaric acid N-monobutylamide, fumaric acid N,N-dibutylamide, maleimide, N-butylmaleimide, N-phenylmaleimide, sodium acrylate, sodium methacrylate, potassium acrylate, and potassium methacrylate. 30

These grafting monomers are grafted in an amount usually of from 0.005 to 10% by weight, and preferably from 0.01 to 5% by weight, based on the olefin polymer. 45

The coat layer provided to improve drying properties of offset inks generally includes a pigment coat layer commonly employed in coated paper. The pigment coat layer usually comprises, as main components, from 50 to 90% by weight of an inorganic fine powder and from 10 to 50% by weight (on a solid basis) of an emulsion type or aqueous solution type resin binder. If desired, the coat layer may further contain from 0.05 to 5% by weight of an antistatic agent such as nonionic surfactant, cationic surfactant, betaine, polyethyleneimine, epichlorohydrine adduct of polyamine-polyamide, ethylene-urea, and polyacrylic ether containing quaternary N⁺ atom. 55

Examples of suitable inorganic fine powders which can be used in the coat layer include calcium carbonate, satin white, silica, titanium oxide, alumina, clay, talc, aluminum hydroxide, zinc oxide, iron oxide, and other pigments. The inorganic fine powder preferably has a particle size of not more than 15 μ m, and particularly from 0.1 to 10 μ m. In addition, organic colorants or polystyrene fine particles called plastic pigments may also be incorporated into the coat layer. 65

Examples of suitable resin binders which can be used in the coat layer include resin emulsions, e.g., an ethylene-vinyl acetate copolymer emulsion, an ethylene-vinyl acetate-vinyl chloride copolymer emulsion, a vinyl acetate-acrylic ester copolymer emulsion, a styrene-butadiene rubber emulsion, a cold-crosslinking acrylic resin aqueous emulsion, and a urethane resin aqueous emulsion; and aqueous solutions of water-soluble high polymers, e.g., starch, carboxymethyl cellulose, and polyvinylpyrrolidone. These binders may be used either individually or in combination of two or more thereof.

For the purpose of facilitating coating, solvents can be incorporated in small amounts into the coating composition. The coat layer may further contain colorants, preservatives, fluidity improving agents, wetting agents, film formation aids, defoaming agents, plasticizers, etc.

The coating composition can be coated using any known coating method. After the coated polyolefin film is dried at the temperature of 70° to 120° C., the above-described coat layer is formed on at least one side thereof.

The synthetic paper having excellent pencil writability and printability can be obtained by coating the above-described coating composition for a coat layer on a laminate base film prepared chiefly by processes (1) to (4) described below.

Process (1)

A polyolefin composition comprising from 35 to 92% by weight of a polyolefin and from 8 to 65% by weight of an inorganic fine powder and an ethylene-vinyl alcohol copolymer are separately melt-kneaded in each extruder, supplied to the same extrusion die, and co-extruded into a two layer laminate film, and the extruded laminate film is stretched in both longitudinal and transverse directions at temperatures lower than the melting point of the polyolefin.

Process (2)

A polyolefin composition comprising a polyolefin and from 8 to 65% by weight of an inorganic fine powder and an ethylene-vinyl alcohol copolymer are separately melt-kneaded in each extruder, supplied to the same extrusion die, and co-extruded together and laminated with a uniaxially oriented film (base layer) obtained by unidirectionally stretching a thermoplastic resin film containing from 3 to 40% by weight of an inorganic fine powder at a stretching temperature lower than the melting point of the thermoplastic resin, to obtain a fusion-laminated film composed of the uniaxially oriented thermoplastic resin film having laminated on one or both sides thereof the polyolefin film and the ethylene-vinyl alcohol copolymer film in this order. The resulting laminate film is then stretched in the direction perpendicular to the stretching direction of the unidirectionally oriented thermoplastic resin film at a temperature lower than the melting point of the polyolefin. A laminate base film in which the paper-like layer(s) are uniaxially oriented and have a number of microvoids, the ethylene-vinyl alcohol copolymer layer is uniaxially oriented, and the base layer is biaxially oriented is obtained.

Process (3)

A polyolefin composition comprising a polyolefin and from 8 to 65% by weight of an inorganic fine powder

AVAILABLE]

42. 5,204,408, Apr. 20, 1993, Modified silicone vulcanization activator; Hiroki Konno, et al., 525/105, 276, 281, 288, 477, 479; 528/24 [IMAGE AVAILABLE]
43. 5,173,529, Dec. 22, 1992, Adhesive organopolysiloxane composition; **Hironao Fujiki**, et al., 524/188; 428/447; 524/730, 731; 528/15 [IMAGE AVAILABLE]
44. 5,130,398, Jul. 14, 1992, Preparation of organopolysiloxane; **Hironao Fujiki**, et al., 528/12, 14, 21, 22, 23, 34, 37, 41; 556/462 [IMAGE AVAILABLE]
45. 5,120,810, Jun. 9, 1992, Adhesive composition; **Hironao Fujiki**, et al., 528/15; 524/263, 265, 266, 730, 731; 528/31, 42 [IMAGE AVAILABLE]
46. 5,118,754, Jun. 2, 1992, Curable liquid silicone rubber compositions; Masanobu Miyakoshi, et al., 524/731, 730, 847, 862 [IMAGE AVAILABLE]
47. 5,112,885, May 12, 1992, Room temperature vulcanizable silicon rubber composition; Yoshio Inoue, et al., 523/213, 212; 524/847 [IMAGE AVAILABLE]
48. 5,086,147, Feb. 4, 1992, Organopolysiloxane composition; Masayuki Ikeno, et al., 528/15, 31, 32 [IMAGE AVAILABLE]
49. 5,072,012, Dec. 10, 1991, Novel alkoxysilanes; **Hironao Fujiki**, et al., 556/435 [IMAGE AVAILABLE]
50. 5,066,714, Nov. 19, 1991, Curable organopolysiloxane putty-like composition; Yoshio Inoue, et al., 524/731, 267, 268 [IMAGE AVAILABLE]
51. 5,064,891, Nov. 12, 1991, Curable silicone compositions; **Hironao Fujiki**, et al., 524/264; 523/109; 524/266, 588, 731, 912 [IMAGE AVAILABLE]
52. 5,039,736, Aug. 13, 1991, Method for the preparation of an organopolysiloxane composition; **Hironao Fujiki**, 524/730; 523/209, 212; 524/188 [IMAGE AVAILABLE]
53. 5,013,772, May 7, 1991, Method for the preparation of silicone rubber composition; **Hironao Fujiki**, et al., 523/213, 209, 212; 528/15 [IMAGE AVAILABLE]
54. 4,990,560, Feb. 5, 1991, Curable organopolysiloxane composition; Masayuki Ikeno, et al., 524/731, 267; 525/478; 528/15, 31, 32 [IMAGE AVAILABLE]
55. ✓ 4,988,758, Jan. 29, 1991, Fluorosilicone rubber composition; Takeshi Fukuda, et al., 524/492, 588, 866; 528/15, 24 [IMAGE AVAILABLE]
56. 4,900,362, Feb. 13, 1990, Primer composition; **Hironao Fujiki**, et al., 106/287.14, 287.19 [IMAGE AVAILABLE]
57. 4,886,865, Dec. 12, 1989, Organopolysiloxane composition; Masayuki Ikeno, et al., 528/15; 525/478; 528/31, 32 [IMAGE AVAILABLE]
58. 4,879,339, Nov. 7, 1989, Storage stable and room temperature-curable organopolysiloxane composition; Masachika Yoshino, et al., 524/740, 741, 751, 752, 773; 525/478; 528/15, 31, 32 [IMAGE AVAILABLE]

der, an adhesive resin, and an ethylene-vinyl alcohol copolymer are separately melt-kneaded in each extruder, supplied to the same extrusion die, and co-extruded together with a uniaxially oriented film (base layer) obtained by unidirectionally stretching a thermoplastic resin film containing from 3 to 40% by weight of an inorganic fine powder at a stretching temperature lower than the melting point of the thermoplastic resin to obtain a fusion-laminated film composed of the uniaxially oriented thermoplastic resin film having laminated on one or both sides thereof the polyolefin film, the adhesive resin layer, and the ethylene-vinyl alcohol copolymer film in this order. The resulting laminate film is then stretched in the direction perpendicular to the stretching direction of the unidirectionally oriented thermoplastic resin film at a temperature lower than the melting point of the polyolefin. There is obtained a laminate base film in which the paper-like layer(s) are uniaxially oriented and have a number of microvoids, the ethylene-vinyl alcohol copolymer layer is uniaxially oriented, and the base layer is biaxially oriented.

Process (4)

A stretched ethylene-vinyl alcohol copolymer film having a stretch ratio of, preferably, from 3.5 to 10 is adhesion-laminated on one or both sides of commercially available finely porous polyolefin type synthetic paper (e.g., Yupo FPG, KPK, GFG or SGG all produced by Oji Yuka Goseishi Co., Ltd.) via a polyurethane or polyester type primer.

The stretching in Processes (1) to (3) is preferably carried out at a stretch ratio of from 4 to 10 in either direction. The stretching temperature ranges from 150° to 162° C. for a propylene homopolymer (melting point: 164°–167° C.) as a polyolefin resin, or from 110° to 120° C. for high-density polyethylene (melting point: 121°–124° C.) as a polyolefin resin. The stretching speed usually ranges from 50 to 350 m/min.

It is preferable that the stretch ratio, stretching temperature, and stretching speed, and the inorganic fine powder content of the polyolefin composition is so selected that the microvoid volume (%) of the finely porous polyolefin film as represented by the following equation falls within a range of from 20 to 60%, and preferably from 25 to 45% and that the finely porous polyolefin film may have a degree of smoothness (JIS P-8119; Bekk's index) of not more than 2,000 seconds.

$$\text{Microvoid volume (\%)} = \{(V_0 - V_1)/V_0\} \times 100$$

wherein V_0 is an average density of the unstretched polyolefin film; and V_1 is a density of the stretched polyolefin film.

When the above-described conditions of microvoid volume and surface smoothness are achieved, the synthetic paper exerts moderate cushioning properties on contact with a printing roller during printing so that a printing ink is smoothly transferred to the synthetic paper to provide beautiful prints. If the microvoid volume is too small, opacity is reduced which impairs the paper-like appearance of the synthetic paper. Also, the cushioning effect is insufficient, causing ink deficiency or insufficient ink transfer due to the shock on contact with a printing roller, and this results in printability deterioration. If the microvoid volume is too large, the support has poor strength, and the resulting synthetic paper is difficult to feed on the printing line.

The finely porous polyolefin film has a thickness usually of from 40 to 500 μm , and preferably of from 60 to 250 μm .

The ethylene-vinyl alcohol copolymer film is more effective to prevent penetration of hydrocarbon solvents and to enhance surface gloss to improve the printing appearance when used as a uniaxially or biaxially stretched film than as a non-stretched film.

The ethylene-vinyl alcohol copolymer film has a thickness usually of from 3 to 30 μm , and preferably of from 5 to 15 μm , and the adhesive resin layer, if present, has a thickness usually of from 5 to 20 μm . If the thickness of the stretched ethylene-vinyl alcohol copolymer film is less than 3 μm , the effect of preventing penetration of hydrocarbon solvents is small, and the resulting synthetic paper tends to curl after printing.

In order to improve the adhesion between the thus prepared laminate base film and a coat layer or in order to provide the synthetic paper with antistatic properties, the surface of the base film on which a coat layer is to be formed may be treated with a primer, if desired.

Examples of suitable primers include polyethyleneimine, poly(ethyleneimineurea), an ethyleneimine adduct of polyamine-polyamide, an epichlorohydrin adduct of polyamine-polyamide, and a tertiary or quaternary nitrogen-containing acrylic polymer. The primer may contain an alkali metal salt or an alkaline earth metal salt such as Na_2SO_4 , K_2SO_4 , Na_2CO_3 , CaSO_4 , MgSO_4 , and $\text{Ca}(\text{NO}_3)_2$ for enhancing the static charge prevention effect.

The primer can be coated by means of a roller coater, a spray coater, a brush, etc. The primer coating amount ranges from 0.01 to 10 g/m^2 , and preferably from 0.01 to 2 g/m^2 , on a solid basis.

The above-described coating composition for a coat layer is then coated on the thus prepared laminate base film by means of a roller coater, a spray coater, a brush, etc. to a coating amount of from 2 to 25 g/m^2 , and preferably from 4 to 20 g/m^2 , on a solid basis. The coat layer has a thickness usually of from 3 to 30 μm , and preferably from 5 to 25 μm .

The synthetic paper according to the present invention with excellent pencil writability and printability can be printed with a printing ink, such as an offset ink.

Printing inks used, for example, in offset printing basically comprise, as main components, pigments with vehicles with auxiliaries including viscosity modifiers, drying controlling agents, and the like as previously described.

The pencil-writable and printable polyolefin synthetic paper according to the present invention can be neatly printed using special offset inks for non-absorbing materials as well as GP offset inks.

Specific examples of suitable pigments of printing inks include azo pigments, e.g., lithol red and benzidine yellow; lake pigments, e.g., permanent green, permanent rhodamine, permanent blue, and Lake Red C; organic pigments, e.g., Brilliant Carmine 6B and Phthalocyanine Blue; and inorganic pigments, e.g., alumina, barium sulfate, red iron oxide, chrome yellow, Prussian blue, titanium white, and carbon black.

Suitable vehicles include synthetic resins, vegetable oils (drying oils), and solvents. Specific examples thereof are linseed oil type vehicles, e.g., linseed oil and stand oil; alkyd type vehicles, e.g., drying oil-modified alkyd resins; and quick-drying resin type vehicles mainly comprising a resin varnish prepared by dissolving a rosin-modified phenol resin in a mixture of

59. 4,742,177, May 3, 1988, Methacrylic acid ester; Yasushi Yamamoto, et al., 556/419 [IMAGE AVAILABLE]

60. 4,721,764, Jan. 26, 1988, Curable organopolysiloxane composition; **Hironao Fujiki**, et al., 528/15; 525/478, 479; 528/31, 32 [IMAGE AVAILABLE]

61. 4,673,621, Jun. 16, 1987, Surface-releasing agent against sticking adhesive; **Hironao Fujiki**, et al., 428/420, 451; 524/544; 526/245 [IMAGE AVAILABLE]

62. 3,992,355, Nov. 16, 1976, Heat-curable organopolysiloxane compositions; Kunio Itoh, et al., 524/862; 502/1; 525/478, 925; 528/15, 31, 32 [IMAGE AVAILABLE]

=> e hara, hiroyasu/in

E#	FILE	FREQUENCY	TERM
E1	USPAT	9	HARA, HIROTAKA/IN
E2	USPAT	9	HARA, HIROTO/IN
E3	USPAT	11 -->	HARA, HIROYASU/IN
E4	USPAT	1	HARA, HIROYOSHI/IN
E5	USPAT	30	HARA, HIROYUKI/IN
E6	USPAT	1	HARA, HIROYUKI DECEASED/IN
E7	USPAT	1	HARA, HISANORI/IN
E8	USPAT	6	HARA, HISAO/IN
E9	USPAT	1	HARA, HISAO DECEASED/IN
E10	USPAT	9	HARA, HISASHI/IN
E11	USPAT	9	HARA, HITOSHI/IN
E12	USPAT	1	HARA, ICHIZO/IN

=> s e3

L2 11 "HARA, HIROYASU"/IN

=> d l2 1-11

1. 5,536,803, Jul. 16, 1996, Adhesive silicone compositions; Hironao Fujiki, et al., 528/15; 525/478, 479; 528/31 [IMAGE AVAILABLE]

2. 5,532,294, Jul. 2, 1996, Thixotropic fluorosilicone gel composition; Masayuki Ikeno, et al., 523/212; 524/847, 862 [IMAGE AVAILABLE]

3. 5,519,096, May 21, 1996, Compounds for solvent resistant silicone gels; **Hiroyasu Hara**, 525/478, 479; 528/15, 31, 42, 43 [IMAGE AVAILABLE]

4. 5,516,838, May 14, 1996, Flame retardant silicone compositions; Hironao Fujiki, et al., 524/711, 714, 720, 722, 731, 862 [IMAGE AVAILABLE]

5. 5,438,094, Aug. 1, 1995, Adhesive silicone compositions; Hironao Fujiki, et al., 524/730, 742, 743, 744, 773, 774, 856, 862; 528/15 [IMAGE AVAILABLE]

6. 5,432,280, Jul. 11, 1995, Gel-forming silicone composition; **Hiroyasu Hara**, et al., 524/730, 265; 528/15, 16 [IMAGE AVAILABLE]

7. 5,391,674, Feb. 21, 1995, Process for producing branched organopolysiloxane; **Hiroyasu Hara**, et al., 528/14, 21, 23, 34 [IMAGE AVAILABLE]

07 Jun. 1999; 13 18

5

linseed oil and tung oil or a low-viscosity linseed oil varnish and controlling the viscosity by addition of petroleum fractions having a narrow boiling point range.

Viscosity controlling agents include solvents, diluted varnishes, and polymer compounds.

Drying controlling agents include dryers and drying inhibitors.

Other auxiliary components include waxes, film-reinforcing agents, and set off inhibitors.

Printing of the polyolefin synthetic paper of the present invention with these printing inks can be carried out in a conventional manner generally employed for offset printing using commercially available offset printing machines.

The polyolefin synthetic paper of the present invention can be employed not only in offset printing as described above but also with other printing techniques, such as gravure printing, flexographic printing, screen printing, seal printing, and letterpress printing. When applied to offset printing or screen printing, in particular, the synthetic paper provides printed material of beautiful appearance, such as labels, posters, calendars, and advertising displays, which do not curl even if the printing ink used contains a large amount of hydrocarbon solvents.

The ethylene-polyvinyl alcohol copolymer layer is formed on either one or both sides of the finely porous polyolefin film. Provision of only one ethylene-polyvinyl alcohol copolymer layer is sufficient where sheets of the synthetic paper immediately after being printed are not stacked on each other as in screen printing or gravure printing. On the other hand, where the printed sheets of synthetic paper are stacked on each other as in offset printing, use of the ethylene-polyvinyl alcohol copolymer film on both sides of the polyolefin film, whereby the solvent in the printing ink of the lower printed sheet is prevented from penetrating into the upper printed sheet to thereby prevent unevenness or curling, is preferred.

The present invention is now illustrated in greater detail by the following Examples, but it should be understood that the present invention is not to be construed as being limited thereto. All the parts, percents, and ratios are by weight unless otherwise indicated.

In Examples and Comparative Examples, curling, printability, pencil writability and opacity of the synthetic paper produced were evaluated in accordance with the following test methods.

1) Curling

Synthetic paper was offset printed using an RI printing machine (manufactured by Akira Seisakusho) and an offset ink "TK Newmark V" (indigo blue) manufactured by Toyo Ink Mfg. Co., Ltd. to an ink coating amount of 2.0 g/m² (wet basis) and allowed to stand at room temperature for 24 hours to dry. The printed sheet was cut to a size of 10 cm × 10 cm, and the cut piece was placed on a horizontal plate. The total height of the four corners of the sheet from the plate was measured.

Further, the synthetic paper was printed with a screen ink "Sericol CG" (produced by Teikoku Ink Seizo K.K.) using a bar coater #10 to an ink coating amount of 8 g/m² (solid basis) and allowed to stand at room temperature to dry. The printed sheet was cut to a size of 10 cm × 10 cm, and the cut piece was placed on a horizontal plate. The total height of the four corners of the sheet from the plate was measured.

2) Offset Printability

Two-color offset printing on the synthetic paper was performed using an offset two-color printing machine manufactured by Mitsubishi Heavy Industries, Ltd. and an offset ink "TK Newmark V" (indigo blue and crimson) manufactured by Toyo Ink Mfg. Co., Ltd., and printing properties were evaluated in terms of ink drying properties, surface unevenness after drying, and set off (back stain) by the following methods.

a) Ink Drying Properties

Immediately after printing, the indigo solid-printed portion (100% dot) was cut out of the printed sheet, and a non-printed sheet of the same synthetic paper sample was superposed on the printed surface thereof. A pressure roller was rolled over the printed surface via the non-printed sheet under a load of 100 g using a Choyokai type printing ink drying tester (manufactured by Toyo Seiseiki K.K.), and the time required until the wet ink under a wide part of the pressure roller was not transferred to the non-printed sheet (setting time) was measured.

b) Surface Unevenness of Printed Sheet

Boundaries between non-printed areas and areas printed solid in each color (100% dot) and in two colors (200% dot) were visually observed from the back side of the printed sheet to see whether any unevenness occurred. The results were rated as follows.

Good . . . No unevenness observed.

Medium . . . Slight unevenness observed.

Poor . . . Obvious unevenness observed.

c) Back Stain

500 sheets of the synthetic paper were printed and piled on a plate, and the number of the sheets whose ink was not transferred to the back surface of the adjacent sheet was counted.

3) Pencil Writability

Writability was evaluated using a commercially available HB pencil under an ordinary writing pressure (200 g). Samples providing writing of sufficient density were rated "good", and those incapable of providing writing of sufficient density even under an increased writing pressure were rated "poor".

4) Opacity

Measured in accordance with JIS P-8138.

EXAMPLE 1

(1) Preparation of Base Layer

A mixture of 80% of polypropylene having a melt flow ratio (MFR) of 0.8 g/10 min, 8% of high-density polyethylene, and 12% of calcium carbonate having an average particle size of 1.5 μm was kneaded in an extruder at 270° C., extruded into sheeting, and cooled by a cooling apparatus to prepare an unstretched sheet. The sheet was heated at 140° C. and longitudinally stretched at a stretch ratio of 5. The resulting stretched sheet was designated Base Layer 1.

(2) Preparation of Laminate Base Film

A mixture of 51% of polypropylene having an MFR of 4.0 g/10 min and 49% of calcium carbonate having an average particle size of 1.5 μm was melt-kneaded in an extruder at 270° C. to obtain Compound (A). Separately, a maleic acid-modified polypropylene resin having a maleic acid content of 0.6% (MFR: 5.5 g/10 min) was melt-kneaded in an extruder at 270° C. to obtain Compound (B). Further, an ethylene-vinyl alcohol copolymer resin having an ethylene content of 46 mol % and an MFR of 6.0 g/10 min (melting point: 165° C.; degree of saponification: 96%) was melted in a separate extruder at 25° C. to obtain Compound (C). Compounds

8. 5,332,795, Jul. 26, 1994, Silicone gel composition excellent in damping property; Hironao Fujiki, et al., 528/15; 525/478, 479; 528/31, 32, 42, 43 [IMAGE AVAILABLE]
9. 5,292,848, Mar. 8, 1994, Fluorosilicone composition and its gellike cured product; Masayuki Ikeno, et al., 528/15, 36 [IMAGE AVAILABLE]
10. 5,206,328, Apr. 27, 1993, Process for the production of an organopolysiloxane; Yoshio Okamura, et al., 528/14, 18, 21, 23, 27, 33, 40; 556/467 [IMAGE AVAILABLE]
11. 5,130,399, Jul. 14, 1992, Process for preparation of organopolysiloxanes; Masayuki Ikeno, et al., 528/14, 33 [IMAGE AVAILABLE]

=> e fukuda, kenichi/in

E#	FILE	FREQUENCY	TERM
E1	USPAT	5	FUKUDA, KEN/IN
E2	USPAT	1	FUKUDA, KEN ICHI/IN
E3	USPAT	23 -->	FUKUDA, KENICHI/IN
E4	USPAT	1	FUKUDA, KENICHIROU/IN
E5	USPAT	39	FUKUDA, KENJI/IN
E6	USPAT	2	FUKUDA, KENSEI/IN
E7	USPAT	7	FUKUDA, KENZO/IN
E8	USPAT	7	FUKUDA, KENZOU/IN
E9	USPAT	1	FUKUDA, KENZOW/IN
E10	USPAT	1	FUKUDA, KIKUO/IN
E11	USPAT	4	FUKUDA, KIMIO/IN
E12	USPAT	2	FUKUDA, KINYA/IN

=> s e2

L3 1 "FUKUDA, KEN ICHI"/IN

=> d 13

1. 4,830,720, May 16, 1989, Method for purifying a dipeptide ester; Tsuneo Harada, et al., 204/522, 530, 539; 205/703 [IMAGE AVAILABLE]

=> s e3

L4 23 "FUKUDA, KENICHI"/IN

=> d 14 1-23

1. 5,837,774, Nov. 17, 1998, Curable fluoropolyether rubber composition; Yasuo Tarumi, et al., 525/104, 100, 102 [IMAGE AVAILABLE]

2. 5,735,408, Apr. 7, 1998, Cassette storing electronic components capable of inhibiting electronic components from mutual contact; **Kenichi Fukuda**, et al., 206/723, 701, 718; 221/156 [IMAGE AVAILABLE]

3. 5,729,688, Mar. 17, 1998, Network element managing system; Moowan Kim, et al., 709/226 [IMAGE AVAILABLE]

4. 5,656,711, Aug. 12, 1997, Curable compositions; **Kenichi Fukuda**, et al., 528/15, 31, 32, 42 [IMAGE AVAILABLE]

5. 5,447,987, Sep. 5, 1995, Organopolysiloxane compositions; Shinichi

6

Art Unit 1711

1. A request for extension of time and an amendment have been filed on June 19, 1998 (paper no. 7).
2. The above amendment and remarks remove some of the rejections cited in earlier Office action, mailed on February 23, 1998 (paper no. 6). Thus the rejection of claims 1, 3, 4 and 9 under 112, 2nd paragraph, in section 1 of that action is now withdrawn; but that of claims 2 and 8 is maintained Applicants' arguments against the said rejection (page 3, paragraph 3 of their response) are not persuasive where they maintain that it is not necessary to provide an upper limit for density and a lower limit for co-efficient thermal expansion. The critical ranges for these properties are cited in the specification, the same should show up in the claims. The claims, which have antecedent basis in the specification, cannot encompass a subject matter having scope broader than the basis. Examiner likes to point out that the rejection of claims 3 and 9 under 112, 2nd paragraph has now been withdrawn because the specification describes the low-melting glasses as those having a melting point of 230° to 450°c (on page 5, last 6 lines). this is however not the case with density and co-efficient of thermal expansion.

Rejection of claims 1, 2 and 8 under 112, 1st paragraph, set forth in section 2 (of some Office action) is now withdrawn.

Claim Rejections - 35 U.S.C. § 112

3. ~~FORM PARAGRAPH 7.31.01 IS THE WRONG FORM PARAGRAPH, PLEASE CHECK YOUR FORM PARAGRAPH BOOK.~~

Sato, et al., 524/731, 263, 265; 528/15 [IMAGE AVAILABLE]

6. 5,420,189, May 30, 1995, Organopolysiloxane compositions; Hirofumi Kishita, et al., 524/731; 528/15 [IMAGE AVAILABLE]

7. 5,412,135, May 2, 1995, Organic silicon compounds and curable organopolysiloxane compositions; **Kenichi Fukuda**, et al., 556/448; 528/12, 15; 556/451 [IMAGE AVAILABLE]

8. 5,403,945, Apr. 4, 1995, Cyclotrisiloxane and process for producing the same; Hirofumi Kishita, et al., 556/460 [IMAGE AVAILABLE]

9. 5,374,702, Dec. 20, 1994, Chain organopolysiloxane and process for producing the same; Hiroshi Inomata, et al., 528/14, 18, 37, 42 [IMAGE AVAILABLE]

10. 5,331,076, Jul. 19, 1994, Siloxane compounds; **Kenichi Fukuda**, et al., 528/27, 42; 549/215 [IMAGE AVAILABLE]

~~11.~~ 5,288,890, Feb. 22, 1994, Fluorine-containing organosilicon compound and process of producing the same; Hiroshi Inomata, et al., 556/440 [IMAGE AVAILABLE]

12. 5,227,502, Jul. 13, 1993, Fluorinated glycidyl ethers and method of making; Toshio Takago, et al., 549/558, 215, 516 [IMAGE AVAILABLE]

13. 5,200,543, Apr. 6, 1993, Siloxane compounds; Hiroshi Inomata, et al., 556/434; 549/215 [IMAGE AVAILABLE]

14. 5,196,558, Mar. 23, 1993, Siloxane compounds; Hiroshi Inomata, et al., 556/434; 549/215; 556/445 [IMAGE AVAILABLE]

15. 5,191,102, Mar. 2, 1993, Process of producing silethylene oxide; Masayuki Oyama, et al., 556/464, 434 [IMAGE AVAILABLE]

~~16.~~ 5,118,828, Jun. 2, 1992, Fluorine-containing organosilicon compound; Toshio Takago, et al., 556/433, 464 [IMAGE AVAILABLE]

~~17.~~ 5,117,026, May 26, 1992, Fluorine-containing organic silicon compounds; Hirofumi Kishita, et al., 556/435 [IMAGE AVAILABLE]

18. 5,117,025, May 26, 1992, Polysilethylenesiloxane; Toshio Takago, et al., 556/434 [IMAGE AVAILABLE]

19. 5,087,720, Feb. 11, 1992, Polysilethylenesiloxane; Hirofumi Kishita, et al., 556/434 [IMAGE AVAILABLE]

20. 4,979,640, Dec. 25, 1990, Apparatus for aligning/supplying electronic component chips; Toru Konishi, et al., 221/156, 172 [IMAGE AVAILABLE]

21. 4,909,913, Mar. 20, 1990, Method for recovering a metal; **Kenichi Fukuda**, et al., 205/560; 204/296; 205/565; 521/25, 27 [IMAGE AVAILABLE]

22. 4,877,498, Oct. 31, 1989, Method for producing a metal salt by electrolysis; **Kenichi Fukuda**, et al., 205/477; 204/296; 521/27 [IMAGE AVAILABLE]

23. 4,707,234, Nov. 17, 1987, Method for separating an acid and an alkali from an aqueous solution of a salt; Takashi Mori, et al., 204/522, 296 [IMAGE AVAILABLE]

Art Unit 1711

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to U. K. Rajguru whose telephone number is (703) 308-3224. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 6:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jim Seidleck, can be reached on (703) 308-2462. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3599.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

U. K. Rajguru:cb
Patent Examiner

September 4, 1998